

THE MINERAL INDUSTRY OF MONGOLIA

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Mongolia is a landlocked country that is bordered by China to the south and Russia to the north. The total land mass is about 1.6 million square kilometers and the population is less than 2.5 million. Since the 1990s, Mongolia has transformed steadily from a centrally planned economy into a market economy. After several years of harsh winters, the weather conditions improved in 2003 and the output of the agriculture sector, which accounted for 20% of the country's gross domestic product (GDP) and employed 40% of its labor force, expanded by 4.5%. The country's economy grew by 5.5%, which exceeded the Government's target of 5%. Industrial output increased by only 0.9% because of a decline in production in the mining and textile sectors. Continued economic growth helped improve living standards and raised income. The country had a per capita income of about \$450, making it one of the poorest countries in the region (Asian Development Bank, 2004, p. 60; International Monetary Fund, 2004, p. 195).

Since the 1990s, the Asian Development Bank and the World Bank have provided loans and assistance to the Mongolian Government to promote the development of a sound financial sector to support private sector-led growth. In 2003, the private sector contributed about 80% of GDP. The two banks continued to support Mongolia's participation in regional cooperation. Mongolia and China have agreed to cooperate on environmental, investment, trade, and transport initiatives. A north-south road system to link China and Russia through the major economic centers in Mongolia, which included Ulaanbaatar, was under study. This road system would help reduce Mongolia's geographic isolation and provide access to the markets of its two neighboring countries (Asian Development Bank, 2003¹). In December 2003, the Parliament approved amendments to the Law of Corporate Income Tax and the Law on Excise Tax Stamp. Effective January 1, 2004, the corporate tax ceiling will be reduced to 30% from 40%. Various tax incentives for foreign investment companies will be terminated. Domestic and international companies will be allowed to print excise tax stamps; before 2004, only the Government security companies had this authority. The Parliament also approved a twofold increase in employee pensions and salaries that will take effect on January 1, 2004, and February 1, 2004, respectively. The Government submitted an amendment to the Parliament that would abolish the 10% value-added tax on gold sales and adjust the royalty for mineral extraction to 2.5% for hard-rock mineral deposits and 7.5% for placer gold deposits (Mongolian News, 2003a[§]). The Government submitted an amendment of the mineral law to the Parliament in 2002; the amendment was expected to be approved in January 2004.

Mongolia has extensive and largely untapped mineral resources. Owing to poor infrastructure, only about 30% of the country's natural resources has been explored thoroughly. The mining sector was expected to play an important role in the country's future economic development. The Government adopted several long-term programs to explore for and develop metallic and nonmetallic minerals, such as coal, copper, fluorspar, gold, oil, and silver. The Government also encouraged foreign investment and participation in exploration, exploitation, and processing of minerals. In 2003, mining accounted for about 30% of the country's industrial output and 60% of its export revenue (Discover Mongolia, 2003).

The country's trade has been heavily influenced by economic developments in China and Russia. In 2003, Mongolia's total trade increased by 14.2% to \$1.39 billion. Because of weak global metal market prices, exports increased by 14.5% to \$600.2 million. Owing to an increased demand for agricultural products, imports increased by 14.0% to \$787.3 million. The value of metal and mineral exports and imports accounted for about 40% of the country's total trade value. Mongolia exported nearly all its output of copper concentrates and molybdenum concentrates to China and nearly all its fluorspar output to Russia. Petroleum and petroleum products remained the leading imported commodities followed by textiles and flour. China and Russia were Mongolia's two major trading partners (Mongolia Gateway, 2004[§]).

The leading mining operation in Mongolia, Erdenet Mining Corp., maintained its mining output of more than 24 million metric tons per year (Mt/yr) of ore, and produced concentrates that contained more than 130,000 metric tons (t) of copper and 1,500 t of molybdenum. Because of the decline in the average ore grade, the output of copper in concentrates decreased to 130,270 t in 2003. Owing to improved ore grades and recovery efficiencies, the output of molybdenum in concentrates increased to 1,793 t. Erdenet and Samsung Corp. of the Republic of Korea signed a joint-venture agreement to build a 25,000-t/yr copper cathode plant that would use Outokumpu's solvent extraction-electrowinning technology at Erdenet. Outokumpu Group of Finland signed a memorandum of understanding with Erdenet to build a 35,000-t/yr copper products plant that would use Outokumpu's HydroCopper process (Outokumpu Group, 2004; Erdenet Mining Corp., 2003[§]).

In 2003, Ivanhoe Mines Ltd. of Canada and a Chinese state-owned company, China International Trust & Investment Corp. (CITIC), signed an agreement to form a strategic alliance for mineral exploration, development, and production projects. CITIC agreed to help Ivanhoe raise capital from international financial markets for selected projects. CITIC also agreed to help facilitate discussion between Chinese and Mongolian Government officials regarding a proposed 290-kilometer railway that would link Bayan Obo in China and Oyu Tolgoi, Mongolia. In June 2003, Government officials from China and Mongolia agreed to cooperate in the development of mineral resources in Mongolia. China will pledge \$300 million in aid for road and railway construction that will link Mongolia's South Gobi and the Chinese border.

Ivanhoe continued to work on its Oyu Tolgoi (Turquoise Hill) project at Oyu Tolgoi in Umnogovi Aimag (Umnogovi Province) in the southern Gobi. The company completed the feasibility study for the development of two gold-rich open pits in the southwestern

¹ References that include a section mark (§) are found in the Internet References Cited section.

and central deposits at Oyu Tolgoi in 2003 and planned to develop the project in two stages. During the first stage, the company would build a 20-Mt/yr ore concentrator mill to produce between 300,000 t/yr and 400,000 t/yr of copper in concentrates. Gold production was expected to be 12.5 t/yr. Initial capital investment was estimated to be \$529 million and the mine would begin production in 2007. During the second stage, the company would expand ore output capacity to 40 Mt/yr by developing the open pit and underground mine at Hugo North. The Oyu Tolgoi project was projected to have the capability to sustain ore output of 40 Mt/yr for 25 years (Mining Journal, 2004).

Gold mining in Mongolia increased significantly during the past decade, and the number of companies engaged in gold mining grew to more than 100 and produced a total of more than 12 t of gold. Most of the companies were placer gold producers and many placer deposits were nearly depleted; as a result, gold output was expected to decline in the near future. Domestic gold demand was mainly for jewelry, and the country exported more than 90% of total output, mainly to China. Before 2002, gold producers were required to sell their output at a fixed price to the Mongol Bank (Bank of Mongolia). Recently, the Government allowed some gold producers and commercial banks to export gold (Mining Journal, 2003).

The Boroo Gold Mine was expected to begin operation in early 2004. The mine was operated by Boroo Gold Company, which was 95% owned by AGR Ltd. of Australia and 5% by Mongolian Altai Trading Co. In March 2002, Cameco Gold Inc. (CGI) acquired a 52% interest in AGR. Under the purchase agreement, CGI would oversee the construction and AGR would operate the mine. The capital cost for the development of the mine was estimated to be \$72 million. The mine is located about 110 kilometers (km) north of Ulaanbaatar, Bayangol district, Selenge Province. Probable reserves at Boroo were estimated to be 10.2 Mt at a grade of 3.52 grams per ton (g/t) gold. The mill was designed to process 1.74 Mt/yr of ore using conventional processing technology to produce 4.6 t/yr of bullion with grades of 85% gold and 5% silver for 8 years (Cameco Corp., 2004).

Entree Gold Inc. of Canada continued exploration at the Shivee Tolgoi (Lookout Hill) concessions, which encompassed a total area of 179,594 hectares and were completely surrounded by Ivanhoe's Oyu Tolgoi prospect. Twenty-five ore samples were collected and analyzed. Results indicated that 10 samples contained greater than 0.5 g/t gold, 5 samples had more than 1.0 g/t gold, and 1 sample contained 22.3 g/t gold. The company planned to continue to conduct gold sample analyses and geochemical and geophysical surveys of the property during 2004 (Entree Gold Inc., 2004).

The International Uranium Corp. (IUC) of Canada through its subsidiary International Uranium Co. (Mongolia) Ltd. held a total of 71 exploration licenses that covered an area in excess of 4.4 million hectares in Mongolia. The company planned to explore for base metals and gold in these areas. In 2003, the company focused on the Tsagaan Tolgoi project in western Mongolia. The company drilled 16 holes, which totaled approximately 3,000 meters, and identified at least 4 copper/gold targets in the Shiveen Gol intrusive complex. Several rock chip samples from the area contained an excess of 1% copper. Shiveen Gol was one of several copper anomalies within the Tsagaan Tolgoi project. IUC signed a letter of intent to transfer all its base and precious metals exploration in Mongolia to Fortress IT Corp. for 28 million shares of Fortress and thus became a major shareholder in Fortress (International Uranium Corp., 2004\$).

Asia Gold Corp. of Canada reported that the company had discovered significant gold mineralization at the Yagaan prospect, which is located 300 km west of Dalanzadgad in southern Mongolia, and about 400 km west of Ivanhoe's Oyu Tolgoi project. The property is located within the Tian Shan (Tian Mountain) copper-gold metallogenic belt in China. In 2003, 98 rock samples from the area were collected; 11 of these samples contained more than 1 g/t gold. The maximum gold assay was 21.4 g/t (Asia Gold Corp., 2004a). Asia Gold also carried out exploration at the Oyut Ovoo prospect, which is located 270 km south of Ulaanbaatar and about 300 km north of Ivanhoe's Oyu Tolgoi project. A total of 505 rock samples were collected; 46 of the samples were greater than 1% copper and 112 samples were more than 0.3% copper. These samples also contained significant amounts of molybdenum. The company planned to continue exploration at the Yagaan and Oyut Ovoo prospects in 2004 (Asia Gold Corp., 2004b).

In 2003, UGL Enterprises Ltd. acquired three exploration licenses—Gold Ram, Huren Tolgoi, and Khondloy in Mongolia. UGL acquired a 100% share of the Gold Ram and an 80% share of the Huren Tolgoi from a British Virgin Islands holding company, Canrim Minerals Ltd. Gold Ram is located in the west-central portion of the Omnogovi Aimag, 75 km southwest of Dalanzadgad in western Mongolia. Previous Russian-Mongolian surveys indicated significant gold mineralization in mesothermal quartz veins within Nomhon formation sediments. The Huren Tolgoi project was held by Canrim under an option agreement with Monresources Co. Ltd. The Huren Tolgoi property is located in the Bayanhongor Aimag, about 50 km south of the city of Bayanhongor, which is located 650 km southwest of Ulaanbaatar. The Huren Tolgoi is surrounded by Ivanhoe's Saran Uul property. Previous Japanese and Mongolian exploration indicated that the area had copper-gold porphyry occurrences. The Khondloy property is located in Bayanhongor Aimag. In the 1980s, Russian explorers recorded that copper-gold mineralization was found on the surface, but no assay results were reported. The company planned to conduct a comprehensive exploration that would include soil geochemical and geophysical analyses in 2004 (UGL Enterprises Ltd., 2003; 2004).

In 2003, Mongolrostsvetmet Mining and Trading Corp.'s subsidiary Ayrag Mining Corp. and One-O-One Inc. of the United States formed a 50-50 joint venture, Mongolia Minerals, to build an aluminum trifluoride plant to produce value-added products in Mongolia. The plant had a designed capacity of 30,000 t/yr and was scheduled to come onstream in 2005 or 2006. All the fluorspar consumed by the plant will be sourced in Mongolia, mainly from the company's own mines. Mongolia Minerals and Davy Process Technology (Switzerland) AG worked jointly to develop the processing technology. The company hoped to export its products to the world market. Ayrag had an output capacity of 180,000 t/yr of acid grade fluorspar and 100,000 t/yr metallurgical grade fluorspar (Industrial Minerals, 2003).

The Government planned to privatize the Metallurgy Plant in Darkham. In 2001, Mongolrostsvetmet won the management contract to run the plant. Since Mongolrostsvetmet took over the plant's management, the financial and operational conditions of the plant

improved. The plant had a crude steel annual output capacity of 100,000 t using local steel scraps. The Government planned to renovate the plant by replacing out-of-date equipment and to add an ironmaking facility to the plant to solve the problem of steel scrap shortages (Mongolian News, 2004§).

China No. 15 Metallurgical Construction Co. won the bid on the construction of Tsaiminerals' Tumurtiin Ovoo Mine near the town of Sukhe Bator, Mongolia. The mine, which was jointly owned by China Nonferrous Metal Industry Engineering Co. Ltd. (51%) and Mentalimpex of Mongolia (49%), could produce 68,000 t/yr of zinc concentrates for 27 years. The mine output will be exported mainly to China (China Metal Bulletin, 2004).

Geologists had discovered that the geologic formations of the Tamsag and East Gobi basins in eastern Mongolia have many similarities with the Erlan and Khailaar basins in China. Recent studies showed that the Tamsag basin had oil reserves of between 50 million barrels and 1.5 billion barrels. SOCO International plc of the United Kingdom explored on the contract block area of XIX, XXI, and XXII in the Tamsag Basin and planned to produce 60,000 t of oil from 15 extraction wells by 2004. Dongsheng Petroleum of China and Roc Oil Co. of Australia jointly explored on the contract block area of XIII and XIV in the eastern Gobi Basin under a production-sharing contract (Mongolian News, 2003b§).

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Major Source of Information

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Major Publications

National Statistical Office of Mongolia, Ulaanbaatar, Mongolia:
Statistical Bulletin, monthly.
Mongolian Statistical Yearbook, annual.

TABLE 1
MONGOLIA: PRODUCTION OF MINERAL COMMODITIES ¹

(Metric tons unless otherwise specified)

Commodity ²	1999	2000	2001	2002	2003 ^c
Cement, hydraulic thousand tons	104	92	68	148	150
Coal do.	4,952	5,185	5,141	5,307	5,900
Copper:					
Mine output, Cu content	126,700 ³	125,227	133,503	131,705	130,270 ³
Metal, refined	1,545	641	1,476	1,500	1,600
Fluorspar:					
Acid grade thousand tons	100	111	127	86	100
Submetallurgical and other grade do.	55	87	72	99	175
Total do.	155	198	199	185	275
Gold, mine output, Au content ⁴ kilograms	10,146	11,808	13,675	12,097	11,100
Gypsum ^c thousand tons	25	25	25	25	25
Lime, hydrated and quicklime do.	50	37	30	41	40
Molybdenum, mine output, Mo content	1,910 ^e	1,335	1,514	1,590	1,793 ³
Petroleum, crude thousand 42-gallon barrels	72	65	74	139	150
Salt, mine output	1,516	1,293	1,800	1,268	1,300
Silver, mine output, Ag content ^{e, 5} kilograms	19,900	25,000	27,200	27,000	27,000
Steel, crude	13,100	13,000	10,000	15,900	16,000
Tungsten, mine output, W content	27	52	63	35	40

^cEstimated; estimated data are rounded to no more than three significant digits.

¹Table includes data available through August 25, 2004.

²In addition to the commodities listed, crude construction materials such as sand and gravel, and varieties of stone such as limestone and silica are produced, but available information is inadequate to make reliable estimates of output levels.

³Reported figure based on 27.5% copper and 50% molybdenum content of copper and molybdenum concentrates, respectively.

⁴Reported raw gold production but excludes gold contained in copper concentrate.

⁵Based on 55 grams of silver per metric ton of copper concentrate.

Sources: National Statistical Office of Mongolia (Ulaanbaatar). Mongolian Statistical Yearbook 1999-2002. Mineral Resources Authority of Mongolia, Mining Office, Output of Mineral Commodities (Minerals Questionnaire 1999-2002).